



EpiNotes

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North Carolina Department of Health and Human Services | Division of Public Health | www.epi.state.nc.us/epi

Outbreak of Shiga toxin-producing *E. coli* (STEC) infections associated with the State Fair – North Carolina, 2011.

On Oct. 24, 2011, the Division of Public Health learned of four cases of shiga toxin-producing *Escherichia coli* (STEC) in Wake County, with a second case reported on Oct. 25. Two of these initial cases had developed hemolytic uremic syndrome (HUS), a severe complication that can occur with STEC infections. This notification began a busy three weeks for the Epidemiology Section, including the North Carolina State Laboratory of Public Health (NCSLPH), Communicable Disease Branch (CDB) and Public Health Preparedness and Response (PHP&R).

Roles and Responsibilities

In addition to providing sample collection kits to local health departments upon request, the role of NCSLPH was to confirm and characterize *Escherichia coli* O157:H7 (EC O157:H7) from clinical materials or isolates submitted to the laboratory. The NCSLPH performs cultures on selective and non-selective media, biochemical reactions, serological reactions, pulsed-field gel electrophoresis (PFGE) and multi-locus variable number tandem repeat analysis (MLVA) to isolate, identify and DNA fingerprint *E. coli* O157:H7. DNA fingerprinting of isolates was critical to separate outbreak cases from sporadic or unrelated cases occurring during the same time-period.

Initially, the role of epidemiologists in CDB was to provide support to Wake County Health Department investigators and assistance in interviewing potential case-patients to elucidate the source of exposure. As the scope of the outbreak expanded beyond Wake County, the epidemiologists in CDB assumed a larger role in coordinating the investigation. In order to facilitate case finding, active surveillance was conducted by hospital-based public health epidemiologists in the PHE network and alerts were sent to North Carolina clinicians, local health departments and microbiology

laboratories. When it became evident that the 2011 North Carolina State Fair was the only common link among cases, a matched case control study was initiated to assess potential exposures at the fair. The CD Branch developed a detailed questionnaire, interviewed cases and controls, and analyzed the data.

The role of PHP&R was to provide support to the investigation by opening the Public Health Coordination Center and filling key roles in the incident command structure, including planning, logistics, finance and communications. Because of the long hours spent investigating this outbreak, including weekend work, accounting for each staff person's time was critical in order to make an accurate assessment of time and money spent on the investigation. As a part of logistics, PHP&R ensured that staff working during the weekend had lunch available and prepared the call center for possible use during the investigation. Updating and distributing the incident action plans and daily situation reports were other key responsibilities filled by PHP&R.

NCSLPH Laboratory Investigation

The Enteric Bacteriology laboratory isolates and identifies *E. coli* O157:H7 by plating a stool sample

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on selective media such as Sorbitol-MacConkey and Chromagar in order to identify sorbitol negative colonies. In addition, an enrichment broth is set up for subsequent shiga toxin testing. Sorbitol negative colonies are then tested for reactivity with O157 and H7 antisera. Biochemical reactions on Triple Sugar Iron (TSI) and Lysine Iron Agar (LIA) plus others are used to confirm *E. coli* O157:H7 as well.

Suspect *E. coli* O157:H7 isolates are provided to the Molecular Epidemiology group for DNA fingerprinting. The gold standard method is PFGE, which takes three days to complete (including the sample preparation, electrophoresis and banding pattern analysis). NCSLPH uses standard methods provided by CDC as part of PulseNet so that results from North Carolina bacterial isolates can be compared to isolates across the nation via electronic means. In this way, potential sources of foodborne illness can be rapidly identified. In addition to PFGE, NCSLPH uses another rapid method known as MLVA to provide additional information about the similarity of isolates. In this outbreak, *E. coli* O157:H7 was isolated from 11 case-patients; both PFGE and MLVA demonstrated that all 11 isolates had very similar DNA fingerprints.

Case Control Study

During the outbreak investigation, it became clear that all cases had visited the State Fair, held during Oct.13-23. Close collaboration with partners in the N.C. Department of Agriculture & Consumer Services (NCDA&CS) throughout the investigation was critical in solving the puzzle regarding which exposure(s) at the State Fair likely led to illness. NCDA&CS provided maps that indicated which events occurred on which days at each location on the fairgrounds. The Environmental Health Section in the Division of Public Health also provided maps showing locations of all the food vendors. With the help of NCDA&CS, over 31,000 email addresses from patrons who pre-purchased tickets online were provided to the public health investigation team. Emails were sent to 11,000 randomly selected patrons from this list to request participation. A link was included to a brief survey asking about their willingness to participate, age and dates of state fair attendance. Of more than 1,000 people who responded that they were willing to participate, 77 were randomly selected and matched to cases based on age (<18, ≥18) and date of fair attendance. This unique approach greatly facilitated the rapid enrollment of three controls for each case,

providing the statistical power needed to maximize our ability to identify the source.

Outcomes

Thanks to the strong partnerships within the Epidemiology Section and with NCDA&CS and Wake County Health Department, the outbreak investigation was concluded on Nov. 9. Results of the investigation were shared with all partners and a public announcement was made on Nov. 10 by Public Health, NCDA&CS and Wake County. Results of the investigation indicated that the exposure likely occurred in the Kelley Building – a permanent structure that housed sheep, goats and pigs during the State Fair and was a livestock competition venue. No other exposures were associated with illness. As a result of this investigation, a multiagency task force is being created by NCDA&CS to evaluate the lessons learned from the 2011 State Fair and to identify additional steps that could be taken to minimize the risk of future outbreaks.

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Lead contamination and exposure at an indoor firing range

Inorganic lead is a toxic metal, and exposure can occur through both ingestion and/or inhalation. Lead toxicity can cause cognitive and neurobehavioral effects in children, and can have hematologic, gastrointestinal, cardiovascular and renal effects in all exposed individuals. Potentially high levels of lead contamination and exposure can occur in indoor firing ranges. (1) In Sept. 2011, facilities staff noted thick layers of black dust on the floor and walls of an indoor firing range located on the first floor of a campus building at Asheville-Buncombe Technical Community College in Buncombe County. Concerned for possible lead dust contamination, the college closed the building and containment measures were put in place. The Division of Public Health's Occupational and Environmental Epidemiology Branch (OEEB) was notified and an investigation was initiated.

Evaluation of Environmental Lead Contamination:

Environmental samples were collected to measure lead residue and airborne lead particles and to ascertain the extent and scope of contamination. The results showed elevated lead levels in the firing range and other areas of the building; the highest level of contamination was on the first floor, with decreased levels on the second and third floor. A nearby daycare center was tested and results were all below standards for lead levels. Vacuum sampling of car floorboards, which can identify lead dust that is carried home on the shoes, found that five of the 30 staff vehicles sampled were elevated.

Evaluation of Lead Exposure:

Employees with regular or prolonged exposure to the building, children 6 years and younger residing in an employee's home, and pregnant women residing in an employee's home were screened for blood lead levels (BLLs) and interviewed. Twenty-nine staff members and six children were screened and all results were below the limit for clinical elevation, which is defined by EPA as 10ug/dL. Of the 29 staff, 25 (86%) had BLLs below the limit of detection (<2.0 µg/dL), and four (14%) had BLLs ranging from 3.4 to 5.1 µg/dL. Interview responses indicated that those with higher BLLs worked and spent more time in the firing range. Given the low BLLs, blood lead screening was not expanded to the nearby daycare center, students or other personnel.

Conclusions & Recommendations

Source: Environmental lead levels were plotted on building schematics. An assessment of the results indicated that lead residue likely migrated from the firing range throughout the building, primarily through the ventilation system. The contamination may have been exacerbated by the replacement of the firing range backstop with a metal smash wall.

Impact: Despite the level of lead contamination, those at high risk for lead exposure were found to have BLLs below the limit of clinical elevation.

Remediation: OEEB has provided the college with a list of clean-up recommendations; once remediation is complete and repeat testing is within industry standards, the building will be re-opened. The firing range will be evaluated separately for re-occupancy and safe operation.

Prevention: It was recommended that the college review management policies for the firing range with respect to facility housekeeping and personal hygiene practices to prevent future exposure to lead dust.

Sources:

1. U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry. ToxGuide™ for Lead (Pb) CAS#7439-92-1. October 2007. <http://www.atsdr.cdc.gov/toxguides/toxguide-13.pdf>

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North Carolina health officials announce key wins in the battle against new HIV disease

As a result of the combined efforts of Gov. Bev Perdue, the General Assembly, the state's Communicable Disease Branch and many state and local agencies, North Carolina has developed effective and integrated HIV/AIDS prevention and care strategies that are making an impact on the state's HIV/AIDS epidemic. These strategies, which were first introduced at the beginning of the "Get Real Get Tested" campaign in October 2006, are to identify new cases of HIV early; link newly identified HIV positive individuals into care and treatment programs; and keeps HIV positive individuals in care and treatment.

During this decade, new reports of HIV reached a peak in 2008 when 1,812 new diagnoses were reported. In 2009, new HIV diagnoses decreased to 1,628. By 2010, preliminary counts indicate a further decrease to 1,487 HIV diagnoses being reported. This represents an 18 percent decrease in the number of new diagnoses being reported.

An estimated 35,000 North Carolinians were living with HIV infections in 2010. That means one-in-257 people in this state are infected with a serious and often deadly virus that can be transmitted from one person to another.

Within the first three years of the testing campaign, HIV tests processed at the State Laboratory for Public Health increased by 73 percent. In addition to HIV testing done by private providers, the combined efforts of local health departments, community-based organizations and public health disease intervention specialists (DIS) identified 492 new HIV positive individuals.

By integrating HIV/STD services and linking existing HIV care, North Carolina received a Health Resources and Services Administration (HRSA) grant. The NCDPH will collaborate with the Center of Infectious Diseases at the University of North Carolina- Chapel Hill, Duke University Center for Health Policy and Inequalities Research, East Carolina University and Wake Forest University to implement a new initiative, which involves HIV testing, and linking HIV patients into care. This is a four-year, \$4 million award from HRSA for Special Projects of National Significance (SPNS), entitled SPNS-LINK. The joint collaboration will be placing greater emphasis on finding people who

are not receiving medical care, linking to them to care and treatment, and assuring that all people know their HIV status. This is in addition to our acute HIV testing program which has received national recognition.

In July 2010, with the support of Gov. Perdue, the General Assembly appropriated \$14M in new ADAP funding. With that funding, 1,800 clients were enrolled into ADAP. In state fiscal year 2011-12, that recurring \$14M will serve 1,545 people. These individuals represent a vulnerable population that would not receive support without ADAP.

"North Carolina is in sync with recommendations from Health Resources and Services Administration (HRSA), by emphasizing the importance of linking HIV positive individuals into medical care", said Dr. Megan Davies, State Epidemiologist. "We are effectively implementing our strategy. HIV positive individuals are much less likely to transmit HIV disease if they are in appropriate care and treatment."

In June 2011, Walgreen's took over the ADAP contract. The company has made significant attempts to reach out to existing clients to assure that anyone enrolled in ADAP is getting their medication every month. The Communicable Disease Branch is utilizing staff and working with key partners to locate HIV positive clients by telephone or face to face visit to ensure that they are receiving care and medications. This has led to an increase in the utilization of ADAP and it is resulting in increased costs.

ADAP uses a combination of state and federal funds to provide low-income residents of North Carolina with assistance in obtaining essential antiviral medications at no cost. These antiviral medications fight the effects of HIV in the infected person and also make them much less infectious to others. The program purchases the medications in bulk from a pharmaceutical wholesaler, and a central pharmacy dispenses and mails prescriptions to clients. The individual is responsible for the cost of other drugs that they receive which are not covered by the program.

Because HIV is a communicable disease, it is important for the health of the public that HIV positive individuals remain in care and on HIV medications. A recent study

led by UNC-Chapel Hill confirmed that treating HIV-infected individuals with antiretroviral therapy (ART) when their immune systems are still relatively healthy led to a 96 percent reduction in HIV transmission.

“This tells us that when everyone knows their HIV status, through routine HIV testing as recommended by CDC, and all people with HIV infection are receiving the right antiretroviral medications under the care of a doctor, we should be able to turn the tide of the AIDS

epidemic and no longer have over a thousand people a year in our state being diagnosed with HIV infections,” Davies said. “We have the opportunity to make HIV and AIDS a rare disease in our state.”

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Community Assessments: Public Safety and Health Messaging during the 2011 Holly Shelter Game Land Wildfire, Pender County, NC

The sustained wildfires that occurred in the Holly Shelter Game Land in Pender County last summer exposed thousands of area residents to potentially dangerous smoke conditions. In response, county officials disseminated several public safety and health messages, including an automated land-line phone call through the DeltAlert system notifying residents of a voluntary evacuation order. In July 2011, the N.C. Division of Public Health (DPH) conducted a Community Assessment for Public Health Emergency Response (CASPER, 1) to evaluate the effectiveness of public safety and public health messages received by residents of the Maple Hill area in Pender County. In Aug. 2011, a joint team from DPH and the University of North Carolina Center for Public Health Preparedness' Team Epi Aid conducted a follow-up CASPER among a larger sample of residents in Pender County. Using random sampling methodology, door-to-door interviews were conducted with a total of 79 and 110 persons in each sample respectively.

The findings of these two CASPERs indicated that residents did not receive sufficient public health and safety information during the fire. In the Maple Hill survey, 54 percent (42 of 79) of respondents reported they had not received any public safety or public health messages. However, in the follow-up survey, only 39 percent (43 of 110) said they had not received these emergency messages. Over 80 percent of respondents in both surveys stated they had not received an automated phone call issued through the DeltAlert system regarding voluntary evacuation. In both

assessments, the two most common sources of received public health and safety information during the fire were television and from friends. Television was most commonly perceived as the most effective mode of communication during emergencies. The assessment also determined that land-line based telephone notification systems for public safety and health messaging may not be the most effective method for communicating with at-risk populations during a sustained wildfire. In North Carolina it is estimated that one-in-four adults live in a wireless-only household (2); future messaging initiatives may consider using wireless networks.

1. North Carolina Department of Health and Human Services, Public Health Preparedness and Response Branch. [<http://epi.publichealth.nc.gov/phpr/casper.html>]
2. Blumberg SJ, Luke JV, Ganesh N, et al. *Wireless substitution: State-level estimates from the National Health Interview Survey, January 2007–June 2010. National health statistics reports; no 39.* Hyattsville, MD: National Center for Health Statistics. 2011

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Epidemiology Section Employee Recognition

Summer 2011

PHP&R Regional Office Implementation Team



(L-R) Nikki Marshall, Dr. Lou Turner, Dr. Amanda Fuller-Moore, Jim Canty, Fred Jamison, Dr. Abha Varma, Lauren Boyle-Estheimer, Brian Combs and Dr. Julie Casani
(Not Pictured) Mary Young, Meghan Prewett, Linda White and Alex Huffman

While it took many people to accomplish the re-organization of PHP&R and the preparedness system, this core team made herculean efforts to accomplish this in a very short time through administration, coordination and sometimes moving boxes and running phone lines. Job descriptions were written, positions posted, over 100 interviews conducted for the 20 new positions, people hired and orientation for staff conducted. Regional office locations were “scouted”, leases negotiated and marshaled through the signature process for occupancy as early as June 1. All of this was

accomplished, with the extensive cooperation of HR and the State Property Office within a three-month period of time!!! Throughout this all, this team maintained professionalism, a sense of humor and a “can do” attitude. This has re-energized the current staff, paved a way for the new staff and has set a tone for the future of the preparedness system.

To have this team function at this high level was inspirational and re-affirmed that honest people really do care about the work they do.

Number of probable and confirmed communicable disease cases in North Carolina by disease for: 1) December 2011, 2) the year 2011, 3) the year 2010, 4) and the average (with 95% confidence intervals) of previous five years (2006 to 2010).

Disease	Cases in December, 2011	Cases in 2011	Cases in 2010	Average cases (95% confidence interval) per year 2006 to 2010
Botulism ¹	0	2	0	1 (0 – 4)
Campylobacter Infection	39	909	851	693 (361 – 1,026)
Chlamydia ²	5,532	54,894 ↑	42,171	39,161 (29,695 – 48,641)
Cryptosporidiosis	0	115	94	114 (22 – 206)
E. coli O157:H7 or other STEC Infection	6	155	97	126 (57 – 194)
Ehrlichiosis ³	6	96	130	67 (40 – 174)
Gonorrhea	1,710	17,485	14,159	15,336 (8,779 – 21,892)
Group A Strep Infection, Invasive	10	181	152	143 (81 – 205)
Haemophilus Influenzae	10	85	128	86 (7 – 179)
Hepatitis A	5	30	48	60 (11 – 109)
Hepatitis B (acute)	10	123	123	128 (66 – 190)
Hepatitis B (perinatal)	0	1	2	2 (0 – 5)
Hepatitis B (chronic) ⁴	90	1,281 ↑	883	873 (662 – 1,085)
Hepatitis C (acute)	5	61	39	29 (6 – 64)
Influenza Death, Adult ⁵	0	26	26	50 (0 – 152)
Influenza Death, Pediatric	0	10	0	3 (0 – 14)
LaCrosse Encephalitis	0	24	22	15 (1 – 31)
Legionellosis	13	85	64	52 (15 – 89)
Listeriosis	2	21	22	25 (8 – 42)
Lyme Disease	8	75	89	66 (23 – 155)
Malaria ⁶	9	43	52	33 (2 – 68)
Measles	0	2	0	1 (0 – 4)
Meningococcal Invasive Disease	2	15	14	22 (4 – 48)
Mumps	0	9	10	20 (0 – 88)
Pelvic Inflammatory Disease	72	677 ↑	513	445 (214 - 647)
Pertussis	18	126	343	287 (121 – 453)
Spotted Fever Rickettsiosis	35	305	292	496 (131 – 1,124)
Rubella	0	1	0	0 (0)
Salmonellosis	126	2,516	2,352	1,862 (1,019 – 2,705)
Shigellosis	11	225	253	237 (89 – 563)
Toxic Shock Syndrome ⁷	4	16	12	10 (0 – 26)
Typhoid Fever	1	8	9	7 (0 – 14)
Vibrio Infections	0	15	28	19 (1 – 38)
West Nile Encephalitis	0	2	0	2 (0 – 12)

¹ Infant, foodborne and wound botulism cases combined; ² Chlamydia annual case average calculated for 2008-2010; ³ Includes HE, HME and unspecified; ⁴ Represents an artificial increase in 2011 due to review and disposition of 2008-2010 cases; ⁵ Influenza-associated adult deaths became reportable in 2010. ⁶ All cases are imported; ⁷ Includes non-streptococcal and streptococcal infections.

↑ = significant increase (≥ 3 standard deviations above average). ↓ = significant decrease (≥ 3 standard deviations below average).

Reportable communicable diseases with NO reported cases in the current year were not included in this report. Because cases are routinely updated, case numbers may change (data was extracted on 1/11/12). Case definitions for these diseases are available at: www.epi.state.nc.us/epi/gcdc/manual/toc.html.

Dr. Megan Davies, State Epidemiologist



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